

What is claimed is:

1. A method for treating material, said method comprising the steps of:

5 heating and pressurizing the material to a temperature between approximately 300°F and approximately 1500°F and a pressure of between approximately 20 atmospheres and approximately 200 atmospheres in a first chamber;

retaining said material in said first chamber at said temperature and said pressure to volatilize a portion of said material;

10 transferring said volatilized portion to a second chamber;

adding oxidant to said second chamber; and

15 oxidizing said volatilized portion in said second chamber at a temperature between approximately 1000°F and approximately 1800°F and a pressure of between approximately 20 atmospheres and approximately 200 atmospheres.

2. The method as recited in claim 1 wherein the step of heating and pressurizing the material in a first chamber comprises injecting steam into said first chamber.

3. The method as recited in claim 1 further comprising the step of  
20 injecting an oxidant into said first chamber.

4. The method as recited in claim 1 further comprising the step of injecting steam into said second chamber.

5. The method as recited in claim 1 wherein said oxidizing step produces a process effluent containing carbon dioxide and said method  
25 further comprises the step of separating a portion of said carbon dioxide from said process effluent.

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6. The method as recited in claim 5 further comprising the step of liquefying said separated carbon dioxide.

7. The method as recited in claim 1 further comprising the step of using an auger in said first chamber to mix and transport the material within said first chamber during said retaining step.

8. The method as recited in claim 1 wherein said first chamber and said second chamber are located within separate pressure vessels.

9. The method as recited in claim 1 wherein said first chamber and said second chamber are located within a single pressure vessel.

10. A method for treating a material, said process comprising the steps of:

heating said material to a first temperature, said first temperature being sufficient to volatilize at least a portion of the material to separate the material into a volatile portion and a residue portion;

disposing said volatile portion in a chamber; and  
hydrothermally treating said volatile portion to chemically convert at least a fraction of said volatile portion.

11. The method as recited in claim 10 wherein said heating step comprises heating the material to a temperature between approximately 300°F and approximately 1500°F.

12. The method as recited in claim 11 wherein said material is pressurized to a pressure of between approximately 20 atmospheres and approximately 200 atmospheres during said heating step.

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13. The method as recited in claim 10 wherein said chamber is a second chamber, said heating step is conducted in a first chamber, and said hydrothermal treating step is performed in said second chamber.

5 14. The method as recited in claim 13 wherein said first chamber and said second chamber are located within separate pressure vessels.

15. The method as recited in claim 13 wherein said first chamber and said second chamber are located within a single pressure vessel.

16. The method as recited in claim 10 wherein said hydrothermal treating step includes the step of reacting said volatile portion with an oxidant.

10 17. The method as recited in claim 10 wherein said hydrothermal treating step comprises the step of holding said volatile portion at a temperature between approximately 1000°F and approximately 1800°F and a pressure of between approximately 20 atmospheres and approximately 200 atmospheres.

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18. A system for treating a material, said system comprising:  
a first chamber;  
a means for volatilizing at least a portion of the material in said first chamber to separate the material into a volatile portion and a residue portion;  
a second chamber;  
a means for transferring said volatile portion from said first chamber to said second chamber; and  
a means for heating and pressurizing said volatile portion in said second chamber to a temperature between approximately 1000°F and approximately 1800°F and a pressure of between approximately 20 atmospheres and approximately 200 atmospheres to chemically convert at least a fraction of said volatile portion.
19. A system as recited in claim 18 wherein said volatilizing means comprises a steam generator for injecting steam into said first chamber.
20. A system as recited in claim 18 wherein said volatilizing means comprises a means for heating the material in said first chamber to a temperature between approximately 300°F and approximately 1500°F and a means for pressuring said material in said first chamber to a pressure of between approximately 20 atmospheres and approximately 200 atmospheres.
21. A system as recited in claim 18 wherein said transferring means is a pipe attached to said first chamber and said second chamber to establish fluid communication between said first chamber and said second chamber.
22. A system as recited in claim 18 wherein said second chamber is a downflow reactor.

23. A system as recited in claim 18 wherein said second chamber is a pipe reactor.

24. A system as recited in claim 18 further comprising a means for introducing an oxidant into said second chamber.

5 25. A system as recited in claim 18 further comprising a means for introducing steam into said second chamber.

26. A system as recited in claim 18 further comprising a means for introducing a supplemental fuel into said second chamber.

10 27. A system as recited in claim 18 further comprising a means for introducing an alkaline material into said second chamber for acid neutralization within said second chamber.

28. A system as recited in claim 18 further comprising a means for regulating the volatilization rate in said first chamber to deliver said volatile portion at a uniform rate to said second chamber.

15 29. A system as recited in claim 28 wherein said regulating means comprises a control circuit for varying the feed rate of material into said first chamber in response to the measured rate of said volatile portion being delivered to said second chamber.

20 30. A system as recited in claim 20 further comprising a control circuit for modulating said heating means in response to the measured rate of said volatile portion being delivered to said second chamber to deliver said volatile portion at a uniform rate to said second chamber.

31. A system as recited in claim 18 wherein said first chamber and said second chamber are located within separate pressure vessels.

32. A system as recited in claim 18 wherein said first chamber and said second chamber are located within a single pressure vessel.

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